

- 1           1.     An integrated circuit (IC) chip package, comprising:
  - 2                 a substrate with an IC chip mounted thereon, wherein the IC chip has an
  - 3                 active surface;
  - 4                 a grease in contact with the active surface of the IC chip; and
  - 5                 a container disposed upon the substrate, wherein the grease is enclosed within
  - 6                 the container and the substrate, and wherein the container is in contact with the
  - 7                 active surface of the IC chip.
- 8
- 9           2.     An IC chip package as defined in Claim 1, wherein the IC chip is a flip chip
- 10           on a flex substrate.
- 11
- 12           3.     An IC chip package as defined in Claim 1, wherein the substrate comprises
- 13           a metallic heat sink.
- 14
- 15           4.     An IC chip package as defined in Claim 3, further comprising an electrical
- 16           connector extending from the active surface, wherein the electrical connector is in electrical
- 17           communication with the IC chip, and wherein the electrical connector comprises a bond wire
- 18           between the active surface and a printed circuit board disposed upon the heat sink.
- 19
- 20           5.     An IC chip package as defined in Claim 1, wherein:
  - 21                 the substrate comprises a metallic heat sink;
  - 22                 the container comprises a metal; and
  - 23                 the container contacts a printed circuit board disposed upon the substrate.
- 24
- 25           6.     An IC chip package as defined in Claim 1, further comprising a flip chip
- 26           disposed over the active surface of the IC chip.

- 1           7.     An IC chip package as defined in Claim 1, further comprising:  
2                 a flip chip disposed over the active surface of the IC chip; and  
3                 an electrical connector extending from the active surface, wherein  
4                     the electrical connector is in electrical communication with the IC  
5                 chip;  
6                     the electrical connector of the IC chip comprises a bond wire;  
7                     the bond wire is in contact with the grease;  
8                     the container comprises a metal; and  
9                     the container is disposed over the IC chip and the flip chip.  
10  
11          8.     An IC chip package as defined in Claim 1, wherein:  
12                 the IC chip is a flip chip; and  
13                 the substrate is a flex substrate.  
14  
15          9.     An IC chip package as defined in Claim 8, wherein the container comprises  
16     a dam structure that secures the container to the substrate.  
17  
18          10.    An IC chip package as defined in Claim 9, further comprising an electrical  
19     connector extending from the active surface, wherein  
20                 the electrical connector is in electrical communication with the IC  
21                 chip; and  
22                 the container and the substrate together enclose the grease, the electrical  
23                 connector, and the IC chip.  
24

1           11. An IC chip package as defined in Claim 1, wherein the grease has a grease  
2 thermal conductivity, the container has a container thermal conductivity, and the grease  
3 thermal conductivity is less than the container thermal conductivity.  
4

5           12. An IC chip package as defined in Claim 1, further comprising a vent hole in  
6 the container.  
7

8           13. An IC chip package as defined in Claim 1, wherein the grease has a thermal  
9 conductivity in a range from about 2 Watts/m·K to about 5 Watts/m·K.  
10

11           14. An IC chip package as defined in Claim 1, wherein the grease has a dielectric  
12 constant in a range from less than about 6 to about 9.  
13

14           15. An IC chip package as defined in Claim 1, wherein the grease has a melting  
15 point in a range from about 190°C to about 220°C.  
16

17           16. An IC chip packgae as defined in Cliam 1, wherein the grease has a weight  
18 loss at about 100°C after 30 days of less than about 0.15%.  
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1           17. An integrated circuit (IC) chip package with IC chip elements having an IC  
2 chip with an active surface, the active surface having extending therefrom an electrical  
3 connector in electrical communication with IC chip, the IC chip being mounted upon a  
4 substrate, the IC chip package comprising:

5                   a grease in contact with the active surface of the IC chip; and

6                   a container disposed upon the substrate and enclosing a volume external to  
7 the IC chip elements, wherein the grease is enclosed within the container and the  
8 substrate, and wherein the grease fills the volume enclosed by the container.

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10           18. An IC chip package as defined in Claim 17, wherein the container has a  
11 container thermal conductivity and the grease has a grease thermal conductivity that is less  
12 than the container thermal conductivity.

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14           19. An IC chip package as defined in Claim 17, wherein the grease is in contact  
15 with a dam structure.

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17           20. An IC chip package as defined in Claim 17, further comprising:  
18                   a vent hole in the container.

19  
20           21. An IC chip package as defined in Claim 17, wherein the grease contacts the  
21 container.

22  
23           22. An IC chip package as defined in Claim 17, wherein the grease has a thermal  
24 conductivity in a range from about 2 Watts/m·K to about 5 Watts/m·K.  
25

1           23.    An IC chip package as defined in Claim 17, wherein the grease has a  
2 dielectric constant in a range from less than about 6 to about 9.

3  
4           24.    An IC chip package as defined in Claim 17, wherein the grease has a melting  
5 point in a range from about 190° C to about 220° C.

6  
7           25.    An IC chip package as defined in Claim 17, wherein the grease has a weight  
8 loss at about 100° C after 30 days of less than about 0.15%.

9  
10          26.    An IC chip package as defined in Claim 17, wherein the container comprises  
11 a metal.

12  
13          27.    An IC chip package as defined in Claim 17, wherein the container makes  
14 contact with the substrate to enclose the active surface of the IC chip.

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16          28.    An IC chip package as defined in Claim 17, wherein the IC chip is a flip chip  
17 on a flex substrate.

18  
19          29.    An IC chip package as defined in Claim 17, wherein the substrate comprises  
20 a metallic heat sink.

21  
22          30.    An IC chip package as defined in Claim 29, wherein the electrical connector  
23 comprises a bond wire between the active surface and a printed circuit board disposed upon  
24 the heat sink.

25  
26          31.    An IC chip package as defined in Claim 17, wherein:

- 1           the substrate comprises a metallic heat sink;  
2           the container comprises a metal; and  
3           the container contacts a printed circuit board disposed upon the substrate.  
4  
5           32.   An IC chip package as defined in Claim 17, further comprising:  
6               a flip chip disposed over the active surface of the IC chip.  
7  
8           33.   An IC chip package as defined in Claim 17, further comprising a flip chip  
9   disposed over the active surface of the IC chip, wherein:  
10           the electrical connector of the IC chip comprises a bond wire;  
11           the bond wire is in contact with the grease;  
12           the container comprises a metal; and  
13           the container is disposed over the IC chip and the flip chip.  
14  
15          34.   An IC chip package as defined in Claim 17, wherein:  
16           the IC chip is a flip chip; and  
17           the substrate is a flex substrate.  
18  
19          35.   An IC chip package as defined in Claim 34, wherein the container is a dam  
20   structure that secures the container to the substrate.  
21  
22          36.   An IC chip package as defined in Claim 34, wherein the container and the  
23   substrate together enclose the grease, the electrical connector, and the IC chip.

1           37. An IC chip package having an IC chip with an active surface, the active  
2 surface having an electrical connector extending therefrom in electrical communication with  
3 the IC chip, the IC chip being mounted upon a board-on-chip (BOC) substrate having a first  
4 side and an opposite second side, the IC chip package comprising:

5                 a grease in contact with the active surface of the IC chip; and

6                 a container disposed upon the BOC substrate, wherein the grease is enclosed  
7 within the container and the substrate, wherein:

8                 the IC chip is mounted on the first side of the BOC substrate;

9                 the IC chip package further comprises a second IC chip; and

10                the second IC chip is disposed over the first side of the BOC substrate.

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12           38. An IC chip package as defined in Claim 37, wherein:

13                the IC chip package further comprises a third IC chip, wherein the third IC  
14 chip is disposed over the first side of the BOC substrate and over the second IC  
15 chip.

- 1           39. An IC chip package having an IC chip with an active surface, the active  
2 surface having an electrical connector extending therefrom in electrical communication with  
3 IC chip, the IC chip being mounted upon a board-on-chip (BOC) substrate having a first side  
4 and an opposite second side, the IC chip package comprising:  
5                 a grease in contact with the active surface of the IC chip; and  
6                 a container disposed upon the BOC substrate, wherein the grease is enclosed  
7 within the container and the substrate, wherein:  
8                 the IC chip is mounted on the first side of the BOC substrate;  
9                 the IC chip package further comprises a second IC chip; and  
10                the second IC chip is disposed over the second side of the BOC substrate.  
11  
12           40. An IC chip package as defined in Claim 39, wherein:  
13                the IC chip package further comprises a third IC chip, wherein the third IC  
14 chip is disposed over the second side of the BOC substrate and over the second IC  
15 chip.

1           41. An IC chip package with IC chip elements having an IC chip with an active  
2 surface, the active surface having an electrical connector extending therefrom in electrical  
3 communication with IC chip, the IC chip being mounted upon a substrate, the IC chip  
4 package comprising:

5                   a grease in contact with the active surface of the IC chip, the grease having:

6                           a thermal conductivity in a range from about 2 Watts/m·K to about 5  
7 Watts/m·K;

8                           a dielectric constant in a range from less than about 6 to about 9;

9                           a melting point in a range from about 190° C to about 220° C; and

10                   a container disposed upon the substrate, the container enclosing a volume  
11 external to the IC chip elements, wherein the grease is enclosed within the container  
12 and the substrate, and the grease fills the volume enclosed by the container.

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14           42. An IC chip package as defined in Claim 41, further comprising:

15                   a flip chip disposed over the active surface of the IC chip.  
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1           43. An IC chip package with IC elements having an IC chip with an active  
2 surface, the active surface having extending therefrom an electrical connector in electrical  
3 communication with IC chip, the IC chip being mounted upon a substrate, the IC chip  
4 package comprising:

5                   a grease in contact with the active surface of the IC chip; and

6                   a container composed of metal, having a thermal conductivity that is greater  
7 than a thermal conductivity of the grease, disposed upon the substrate, and in contact  
8 with both the grease and the substrate, the container enclosing a volume external to  
9 the IC elements, wherein:

10                   the grease is enclosed within the container and the substrate, and the

11                   grease fills the volume enclosed by the container; and

12                   the container and the substrate enclose the active surface of the IC  
13 chip.

14  
15           44. The IC chip package as defined in Claim 43, wherein the grease has:

16                   a thermal conductivity in a range from about 2 Watts/m·K to about 5  
17 Watts/m·K;

18                   a dielectric constant in a range from less than about 6 to about 9; and

19                   a melting point in a range from about 190° C to about 220° C.  
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